



A Duke Energy Company

R. A. JONES  
Vice President

Duke Power  
29672 / Oconee Nuclear Site  
7800 Rochester Highway  
Seneca, SC 29672

864 885 3158  
864 885 3564 fax

April 26, 2004

U.S. Nuclear Regulatory Commission  
Document Control Desk  
Washington, D.C. 20555

Subject: Oconee Nuclear Station  
Docket Nos. 50-269,-270, -287  
Licensee Event Report 287/2004-01, Revision 0  
Problem Investigation Process No.: O-04-0991

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a)(1) and (d), attached is Licensee Event Report 287/2004-01, Revision 0, regarding a reactor trip due to closure of the turbine stop valves as a result of foreign material in the hydraulic control fluid.

This report is being submitted in accordance with 10 CFR 50.73 (a)(2)(iv)(A). This event is considered to be of no significance with respect to the health and safety of the public.

There are no NRC Commitment items contained in this LER.

Very truly yours,

R. A. Jones

Attachment

IE22

Document Control Desk

Date: April 26, 2004

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cc: Mr. Luis A. Reyes  
Administrator, Region II  
U.S. Nuclear Regulatory Commission  
61 Forsyth Street, S. W., Suite 23T85  
Atlanta, GA 30303

Mr. L. N. Olshan  
Project Manager  
U.S. Nuclear Regulatory Commission  
Office of Nuclear Reactor Regulation  
Washington, D.C. 20555

Mr. M. C. Shannon  
NRC Senior Resident Inspector  
Oconee Nuclear Station

INPO (via E-mail)

## LICENSEE EVENT REPORT (LER)

(See reverse for required number of  
digits/characters for each block)

Estimated burden per response to comply with this mandatory information collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by Internet e-mail to bjs1@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

## 1. FACILITY NAME

Oconee Nuclear Station, Unit 3

## 2. DOCKET NUMBER

050- 0287

## 3. PAGE

1 OF 7

## 4. TITLE

Unit 3 Trip Due to Foreign Material in Turbine Electro-Hydraulic Control System

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
02	26	04	2004	- 01	- 0	04	26	2004	None	
9. OPERATING MODE		1	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5: (Check all that apply)							
10. POWER LEVEL		100	20.2201(b)			20.2203(a)(3)(ii)			50.73(a)(2)(ii)(B)	50.73(a)(2)(ix)(A)
			20.2201(d)			20.2203(a)(4)			50.73(a)(2)(iii)	50.73(a)(2)(x)
			20.2203(a)(1)			50.36(c)(1)(i)(A)		X	50.73(a)(2)(iv)(A)	73.71(a)(4)
			20.2203(a)(2)(i)			50.36(c)(1)(ii)(A)			50.73(a)(2)(v)(A)	73.71(a)(5)
			20.2203(a)(2)(ii)			50.36(c)(2)			50.73(a)(2)(v)(B)	
			20.2203(a)(2)(iii)			50.46(a)(3)(ii)			50.73(a)(2)(v)(C)	OTHER Specify in Abstract below or in NRC Form 366A
			20.2203(a)(2)(iv)			50.73(a)(2)(i)(A)			50.73(a)(2)(v)(D)	
			20.2203(a)(2)(v)			50.73(a)(2)(i)(B)			50.73(a)(2)(vii)	
			20.2203(a)(2)(vi)			50.73(a)(2)(i)(C)			50.73(a)(2)(viii)(A)	
			20.2203(a)(3)(i)			50.73(a)(2)(ii)(A)			50.73(a)(2)(viii)(B)	

## 12. LICENSEE CONTACT FOR THIS LER

NAME B.G. Davenport, Regulatory Compliance Manager	TELEPHONE NUMBER (Include Area Code) (864) 885-3044
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## 13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
A	TG	SHV	G080	Y					

## 14. SUPPLEMENTAL REPORT EXPECTED

YES (If yes, complete EXPECTED SUBMISSION DATE). X NO

## 15. EXPECTED SUBMISSION DATE

MONTH DAY YEAR

## 16. ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

At 11:50:56 on 02-26-2004 Oconee Unit 3 reactor tripped on high Reactor Coolant System pressure approximately three minutes after an Electro-Hydraulic Control (EHC) pump was returned to service following routine maintenance. Post-trip response was normal.

Investigation found that a small piece of foreign material, specifically a piece of clear plastic packaging material, inadvertently entered the system during replacement of a discharge filter. The material clogged the hydraulic fluid entry port of a turbine stop valve, causing all four stop valves to close.

The root cause was determined to be inattention to detail by two Maintenance technicians performing the task. The material was found and removed.

This event is considered to have no significance with respect to the health and safety of the public.

**LICENSEE EVENT REPORT (LER)**

FACILITY NAME (1)	DOCKET (2) NUMBER (2)	LER NUMBER (6)			PAGE (3)
Oconee Nuclear Station, Unit 3	0500387	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	2 OF 7
		2004	01	00	

NARRATIVE (If more space is required, use additional copies of NRC Form 366A) (17)

**EVALUATION:**

**BACKGROUND**

This event is reportable per 10CFR 50.73(a)(2)(iv)(A) as an event which resulted in a Reactor Trip at Oconee Nuclear Station (ONS).

Steam from the steam generators (SG) [EIIS:SG] flows through four Main Turbine Steam Stop Valves (MSSVs) [EIIS:SHV] to the turbine control valves [EIIS:FCV]. These valves require hydraulic pressure to open and closure is spring-assisted, thus the valves fail to a safe position. The number two MSSV, 3MS-104, acts as a pilot valve: when it is sufficiently open, the other three MSSVs open; when it is sufficiently closed, the other three MSSVs go closed.

The MSSVs close automatically upon a reactor trip to isolate the turbine to help prevent Reactor Coolant System (RCS) [EIIS:AB] overcooling and to isolate the unaffected SG in the event of a main steam line break.

ONS utilizes an Electro-Hydraulic Control (EHC) [EIIS:TG] System to provide hydraulic pressure to control both the MSSVs and the turbine control valves. The EHC System features two independent and parallel pumping systems. Each pumping system consists of a motor driven pump, a wire mesh suction strainer, and a discharge filter. The discharge filter is the last filtering media in the EHC System, prior to the MSSVs and the turbine control valves. The filters are set up on a 6 month preventative maintenance frequency and are routinely changed out with the unit on line.

Prior to this event ONS Unit 3 was operating at 100% power with no safety systems or components out of service that would have contributed to this event.

**EVENT DESCRIPTION**

At approximately 06:00 hours on 02-26-2004, Operations aligned the Unit 3 EHC system to allow preventative maintenance activities related to the 3B EHC pump, including change out of various filters in the EHC fluid flow path.

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NARRATIVE (If more space is required, use additional copies of NRC Form 366A) (17)

AT 1147 hours Operations started the 3B EHC pump as part of a post maintenance test. Therefore both the 3A and 3B EHC pumps were in operation.

At 11:50:43 hours, the MSSVs began closing. Almost immediately Main Steam (MS) [EIIS:SB] Pressure began to increase, followed by RCS pressure.

At 11:50:56 Reactor Protective System (RPS) [EIIS:JC] channels B and C tripped on high RCS pressure (2371 psig), which tripped the reactor. RPS channels A and D tripped within an additional 0.3 seconds.

Post trip response was "normal". All control rod drive [EIIS:AA] breakers tripped and control rods dropped into the core within the required response times. The turbine tripped on generator lockout as expected due to the reactor trip. Unit auxiliary power automatically transferred from the Normal to Start-up source as expected. Main Feedwater [EIIS:SJ] remained in service, with flow demand automatically reduced by the Integrated Control System [EIIS:JA]. RCS temperature, RCS pressure, RCS inventory, MS Pressure, and SG inventory remained within expected limits. No actuations or actuation demands occurred related to Emergency Feedwater [EIIS:BA] or Engineered Safeguards [EIIS:JE] (i.e. Emergency Core Cooling [EIIS:BG and BP], Containment Isolation [EIIS:NH], Containment Spray/Cooling [EIIS:BE and BK], and Emergency Power [EIIS:EK]).

The post-trip investigation confirmed that the first indications of anything abnormal were computer indications that 3MS-104 began to close. 3MS-104 acts as a pilot valve for the other three MSSVs. When 3MS-104 reached 90% closed, a design feature of the EHC system automatically began shutting the other three MSSVs.

As the MSSVs closed, the MS flow was greatly reduced, which reduced the rate of heat removal from the reactor. Therefore the RCS heated up (to approximately 586 F average temperature) which caused pressure to spike, actuating the RPS.

The post-trip investigation subsequently found a small piece of clear plastic clogging the pilot supply port of the servo valve for MSSV #2 (3MS-104). The piece was approximately 1.5 inches long and 3/4 inches wide. The shrink wrap plastic packaging material removed from the outlet filter cartridges was retrieved and found to have a missing section which matched the piece removed from the system.

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NARRATIVE (If more space is required, use additional copies of NRC Form 366A) (17)

## CAUSAL FACTORS

The root cause of this event is lack of attention to detail on the part of the two Nuclear Maintenance Specialists who installed new filters in the EHC system. When inspecting the filters prior to installation, they did not detect that a piece of shrink wrap remained attached to one filter. The associated EHC pump was started which transported the piece into the system. Approximately three minutes later it blocked the flow of hydraulic fluid to MSSV 3MS-104, which caused all four MSSVs to close, resulting in the reactor trip.

The following program weaknesses were identified as contributing causes:

1) Management standards and expectations are not well defined in respect to FME. Nuclear Systems Directive 104 "Materiel Condition/Housekeeping, Cleanliness/and Foreign Material Exclusion and Seismic Concerns", the FME controlling document, is part of a broad based directive that includes material condition, housekeeping, and seismic concerns. The directive does not contain:

- "how to" instructions related to cleanliness inspections of new parts,
- expectations for the use of auxiliary lighting (e.g. flashlight or work light) for FME prevention
- precautions concerning clear plastic (except in areas of the Spent Fuel Pool and Containment)

2) No maintenance procedure exists to provide the level of detail needed at the craft level.

3) No maintenance procedure exists for changing the EHC Discharge filter.

Interviews with the technicians on the afternoon after the trip indicated no problems associated with fitness for duty (substance abuse, fatigue, overwork, illness, stress, etc.), time pressure, communications, training, supervision, etc. Both have been employed at ONS over 20 years. They have performed this task numerous times in the past but the last occasion was approximately one year ago.



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NARRATIVE (If more space is required, use additional copies of NRC Form 366A) (17)

## CORRECTIVE ACTIONS

### Immediate:

1. Operators took appropriate actions to bring the unit to stable hot shutdown (Mode 3).

### Subsequent:

1. As part of post trip troubleshooting, the foreign material was discovered and removed from the system.

### Planned:

1. Revise Nuclear Systems Directive 104 "Material Condition/Housekeeping, Cleanliness/and Foreign Material Exclusion and Seismic Concerns" to incorporate lessons learned from this event.
2. Develop a Maintenance Procedure to provide specific instructions to the craft personnel for FME control when high risk systems are breached.
3. Develop a Maintenance Procedure for maintenance of EHC discharge filters.

These corrective actions are not considered NRC Commitment items. There are no NRC Commitment items contained in this LER.

## SAFETY ANALYSIS

This event did not include a Safety System Functional Failure.

As described in Section 7.2.2.3.5 of the Updated Final Safety Analysis Report (UFSAR), high RCS pressure is one parameter which initiates a reactor trip. A reactor trip is an anticipated transient and is considered the safe end state following many plant transients and most accident scenarios addressed in Chapter 15 of the UFSAR. In this event, all required systems and equipment operated as designed to mitigate the consequences of the high reactor pressure. Specifically, the unit tripped and achieved mode

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3 while Main Feedwater properly maintained SG levels as needed to remove decay heat from the RCS.

## CDF Impact

The significance of this event with respect to core damage frequency (CDF) has been evaluated quantitatively by considering the following:

- A reactor trip initiating event
- Actual plant configuration and maintenance activities at the time of the trip

The conditional core damage probability for the event being evaluated is estimated to be  $4.6E-7$ , which is less than the accident sequence precursor threshold of  $1.0E-6$ . This event is considered a reactor trip with no complications. The closure of MSSV #2 and subsequent reactor trip has little impact on the overall reactor trip sequence quantification.

## LERF Impact

The Large Early Release Frequency (LERF) for ONS is dominated by seismic and the Interfacing Systems LOCA initiating events. The availability of the important containment safeguards systems (Containment spray and reactor building cooling units) was not impacted by the reactor trip. As a result, this event is judged not to be significant with respect to the LERF for Oconee.

Therefore, there was no impact on the health and safety of the public due to this event.

## ADDITIONAL INFORMATION

There were no releases of radioactive materials, radiation exposures or personnel injuries associated with this event.

This event is not considered a recurring event because there has not been a similar event due to similar causes within at least the prior two years. There has not been a trip at Oconee associated with a FME event within the current computerized data base (covering approximately ten years). In 2002 ONS recognized an adverse trend in FME events/issues and initiated several measures



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for improvement. These included establishing a FME steering team to improve the cultural sensitivity to the consequences of FME events among ONS employees.

The trip of the Reactor constitutes a Maintenance Rule functional failure and is considered reportable under the Equipment Performance and Information Exchange (EPIX) program.